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Effect of Foliar Spraying with (Micro Nate) and Fol Spray Fertilizer on the Traits of Vegetative Growth for Apple Seedlings (Anna Cultivar)

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EFFECT OF FOLIAR SPRAYING WITH (MICRO NATE) AND FOL SPRAY FERTILIZER ON THE TRAITS OF VEGETATIVE GROWTH FOR APPLE SEEDLINGS (ANNA CULTIVAR)

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Abstract

This experiment was conducted during the agricultural season (2018-2019) in one of the nurseries in Al-Qasim district of Babylon province. To study the effect of spraying with nutrient solution MICRO NATE and spraying with fol spray fertilizer on some vegetative growth traits of apple seedlings (*Malus domestica*) Anna. The experiment included testing three concentrations of MICRO NATE (0.04, 8 g. L⁻¹) and three concentrations of fol spray Fertilizer (0.03 and 6 g. L⁻¹). A factorial experiment was conducted according to the Completely randomized design with three replications averages were compared using the least difference test (L.S.D) below the 5% probability level, according to the program Genestat 2010. The results concluded with the following: Spraying plants with MICRO NATE fertilizer at a concentration of (8 g.L⁻¹) separately and spraying with fol spray fertilizer at a concentration of (6 g.L⁻¹) separately, led to the significant increase in all studied traits compared to the lowest values resulting from plants treated with distilled water (control treatment). Results of the interaction between spraying plants with MICRO NATE fertilizer at a concentration of (8 g.L⁻¹) With spraying with fol spray fertilizer at a concentration of (6 g.L⁻¹) showed the significant increase in plant height, total number of leaves and increase in leaf content of total chlorophyll.

Keywords: nutritious, fol spray, apple, cultivar, MICRO NATE

1. Introduction

Apples *Malus domestica* belongs to the Rosaceae family and is considered a fruit trees temperate climate areas [1] Southwestern Asia areas were believed to be the Original country of the fruit trees, where it is found growing wild in the Caucasus Mountains and Turkestan. [2] it also known in Mesopotamia since human settlement began at the end of the fifth millennium BC. Importance in its cultivation was not given until the 1960 s, as there was a clear interest in Importing some foreign varieties and breeding them in Iraq [3] Apples are of economic importance, especially in high-productivity countries, as they are an important economic resource for their high nutritional value, health and contain high energy because of the content of carbohydrates, proteins, pectin, fats and vitamins such as vitamin A, B and C. It also contains mineral salts such as Ca, P, K organic acids, the most important of which is malic acid, which is the dominant acid in apple fruits [4]. The Anna cultivar was brought for Iraq at (1994-1995) through the Ministry of Agriculture and later cultivated in central Iraq to It is suitable for climate conditions [5]. This cultivar was produced by hybridization between Golden delicious and Red Hadassiya [6]. The fruits of this cultivars are excelled largely in size, hardness and have a good fruit flavor and a sweet taste to semi-acid. Its fruits maturity at the end of June and the beginning of July. Trees begin to conceive at the age of two or three years of cultivation in a permanent location [7]. Many studies have confirmed the importance of nutrients, whether macro or micronutrients, as the reduction of these elements, affects plant growth and development as a result of the entry of these elements in many bio processes within plant tissues [8]. The researches have confirmed that 85% of the plant's need for nutrients can be processed through foliar nutrition as the absorption is very fast, especially in soils where the absorption of nutrients is very difficult and which holds some elements, including (Cu, Fe, Mn, (Zn) These elements are held by soil molecules and are therefore difficult to absorb [9]. macronutrients also contribute to many physiological processes within the plant. Nitrogen is involved in many biological processes within the plant, which have an important role in increasing



photosynthesis within plant tissues [10]. Phosphorus also contributes significantly to metabolic processes as it enters the synthesis of cell membranes, nucleic acids and ATP-rich compounds[11]. Potassium also plays an important role in enzymatic activity and in regulating the opening and closing of Stomata and water retention [12]. And for the importance of apple seedlings, This study aims to know the effect of these two nutrients on the growth and development of these seedlings

2. Materials and methods

This experiment was conducted during the agricultural season(2018-2019) in one of the nurseries in Al-Qasim district of Babylon province, To study the effect of spraying with nutrient solution MICRO NATE and fol spray Fertilizer on some vegetative growth traits of apple seedlings (*Malus domestica*). The experiment included testing three concentrations of MICRO NATE (0.04, 8 g. L⁻¹) and three concentrations of fol spray Fertilizer (0.03, 6 g. L⁻¹). a factorial experiment was conducted according to the Completely randomized design with three replications averages were compared using the least difference test (L.S.D) below the 5% probability level, according to the program Genestat 2010. The seedlings were brought from the agricultural plant in Tuwairij district. It was selected 81 seedlings cultivar (Anna) its propagation by stem cutting. At the age of 7 months, cultivation in polyethene bags of 20 cm diameter, filled with 1.5 kg loamy soil, All service operations of irrigation, weeding and pest control were conducted on the seedlings. The different concentrations of MICRO NATE solution and Foliar Fertilizer (fol spray) were sprayed on 25/3/2019 with a time difference between spraying and the other 15 days by 3 spray, Foliar Fertilizer Spray was conducted after spraying with MICRO NATE solution. It was conducted early in the morning and used drops of dishes washing solution to increase the surface tension and the adhesion of solutions on the leaves and used backpack sprayer capacity of 2 liters. The Completely Randomized Design (C. R.D) was used as a factorial experiment included testing three concentrations of MICRO NATE and three concentrations of Foliar Fertilizer with three replicates in each replicate nine treatments. the averages were compared using the least difference test (L.S.D) below the 5% probability level[13], according to the program Genestat. it used MICRO NATE fertilizer, which contains a combination of nutrients in Table (1) and The fol spray fertilizer contains a combination of the nutrients in Table (2).

Table 1. foliar fertilizer components (MICRO NATE)

nutrients	copper	zinc	manganese	boron	iron	Magnesium	Molybdenum
percentage	0.15	0,20	2	0.4	9.3	2	0.10

Table 2. foliar fertilizer components (fol spray)

nutrients	Nitrogen	P2O5	K2O	SO3	Molybdenum	copper	zinc	manganese	boron	iron
percentage	11	40	11	16	9	20	20	90	80	190
	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm

3. studied traits

1. The number of leaves: It was calculated for each plant.
2. The Percentage of dry matter in the leaves: measured after calculating the fresh weight of the leaves and then dried in the oven at 70 ° C, The dry weight was then calculated by dividing the fresh weight by the dry weight of the leaves in percentage.
3. The stem diameter: Measured by Vernier.
4. Estimating The leaves content of chlorophyll: estimating in adult and full-length leaves were conducted by the Chlorophyllmeter devices Type of Spade-502 equipped by Minolta Co. Ltd. JAPANESE LTD.
5. The Leaf content of mineral elements N, P, K: The mineral elements was estimated by collecting a number of leaves. It was washed with water and then distilled water and then placed in perforated paper bags and placed, It was placed in Oven at 70 ° C. After drying, the paper forms were milling using electric milling, then 0.5 g was taken from each sample and digested using sulfuric acid and perchloric acid and colorless extracts ready for metallurgical determination. According to the recommendations of A.O.A.C, 1970, the elements were estimated according to nitrogen (Page, 1982) and phosphorus[14] and potassium[15].

4. Results and discussion

4.1. Vegetative traits

The results in Table (5) showed that the spraying the nutrient solution (MICRO NATE) has a positive effect to improve vegetative growth traits, The spraying treatment with concentration $(8)\text{g.L}^{-1}$ was significant which gave the highest average of the number of leaves (230.4), the highest percentage of dry matter in the leaves (54.32%), the highest average of stem diameter (11.15 mm) and an increase in the leaves content of chlorophyll (35.26 SPAD) compared to the control treatment which gave the lowest average of these traits, which gave (181.8), (36.86%), (5.69 mm) and (28.08 SPAD), respectively. The increase in these vegetative traits above may be due to the content of this solution of important nutrients such as micronutrients, The increase in these vegetative traits above may be due to the content of this solution of important nutrients such as micronutrients needed by the plant in the processes of division and elongation of cells and enter in many processes, including photosynthesis and also the entry into enzymatic activity, which reflected positively in increasing Vegetative growth (Devlin and Witham 1993,) Foliar Fertilizer (fol spray) also was a significant effect on these traits. The spraying treatment with concentration $(6)\text{g.L}^{-1}$ was significant excelled which gave the highest average of the number of leaves (213.9), the highest percentage of dry matter in the leaves (47.61%), the highest average of stem diameter (9.23 mm) and the increase in the leaves content of chlorophyll (32.97 SPAD) compared to the control treatment which gave the lowest average of these traits which gave amounted (197.7), (42.32%), (7.18 mm) and (30.17 SPAD), respectively. This increase may be due to the role of this fertilizer because it contains macro and micro nutrients such as phosphorus, potassium, magnesium, iron, zinc, manganese, etc. These compounds and elements have a role in activating enzymes for different growth activities, including photosynthesis (Tisdale et al., 1993). The results in the same table show that the interaction between the two experimental factors was a significant effect on these traits. The interaction treatment between the spraying nutrient solution (MICRO NATE) at the concentration $(8)\text{g.L}^{-1}$ with a fertilizer (fol spray) at the concentration $(6)\text{g.L}^{-1}$ which gave the highest percentage of dry matter in the leaves (57.17%), the highest average of stem diameter (12.63 mm) and the increase in the leaves content of chlorophyll (37.18 SPAD) compared to the control treatment which gave the lowest average for these traits amounted of (181.8), (36.86%), (5.69 mm) and (28.08 SPAD), respectively, The increase in interaction treatment may be due to the content of these fertilizers of the macro and micro nutrient, this combined led to the improvement of vegetative traits.

Table 3. Effect of foliar spraying with the nutritional solution and Fol spray fertilizer on the traits of vegetative growth for apple seedling (Anna cultivar)

The leaves content of chlorophyll) SPAD(The stem diameter (mm)	The Percentage of dry matter in the leaves(%)	Total Number of leaves)Leaf.plant-1(Traits Treatments
The nutritional solution (MICRO NATE) levels(g.L^{-1})				
28.08	5.69	36.86	181.8	0
31.67	7.46	44.01	203.5	4
35.26	11.15	54.32	230.4	8
3.19	2.20	4.24	21.53	L.S.D 5%
The nutritional solution (fol spray) levels(g.L^{-1})				
30.17	7.18	42.32	197.7	0
31.87	7.89	45.25	204.1	3
32.97	9.23	47.61	213.9	6
3.19	2.20	4.24	21.53	L.S.D 5%
The interaction levels between MICRO NATE and Fol spray (g.L^{-1})				
26.93	5.12	35.14	175.8	0
28.32	5.77	37.10	182.3	3
29.00	6.17	38.33	187.2	6
30.24	6.43	40.67	197.1	0
32.03	7.00	44.03	202.1	3
32.73	8.97	47.33	211.3	6
33.33	10.00	51.16	220.0	0

35.27	10.82	54.63	228.0	3
37.18	12.63	57.17	243.2	6
5.53	3.81	7.34	37.30	L.S.D 5%

4.2. chemical traits of leaves

The results in Table (5) showed that spraying the nutrient solution (MICRO NATE) has a positive effect to improve chemical traits of leaves. The spraying treatment with concentration (8) g.L^{-1} was significantly excelled which gave the highest average of the leaves content of nitrogen (1.53%), phosphorus (0.27%) and potassium (1.93%) compared to the control treatment which gave the lowest average of these traits (1.11%), (0.14%) and (1.30%) respectively. This may be due to that spraying the nutrient solution MICRO NATE It led to increased absorption of nutrients availability by the vegetative total and increased concentration in leaves and other parts of the plant and the content of this fertilizer of elements as nutrients are absorbed directly into the leaf cells to contribute to increased nutrition making by increasing the efficiency of net photosynthesis [16]. The spraying treatment with concentration (6) g.L^{-1} was significantly excelled which gave the highest average of the leaves content of elements 1.41%, 0.23% and 1.72%, respectively. While the control treatment gave the lowest rate for these traits (1.25%), (0.19%) and (1.52%) respectively. The reason for this increase may be due to this fertilizer contains enough quantities of nutrients. When sprayed on the leaves, it is absorbed by the leaves, which causes a high percentage or that this fertilizer caused an increase in the vegetative total and increased leaf area of the plant and then increased representation and increased absorption of elements by the plant Reflected in increasing leaf content of mineral elements [16], As for the interaction between the two experimental factors, The interaction treatment between the spraying nutrient solution (MICRO NATE) at the concentration (8) g.L^{-1} with a fertilizer (fol spray) at the concentration (6) g.L^{-1} which gave the highest percentage of nitrogen (1.62%), Phosphorus (0.30%) and potassium (2.04%) compared to the control treatment which gave the lowest average of these traits (1.25%), (0.19%) and (1.52%) respectively. Through the study, we can conclude that spraying with nutrient solution MICRO NATE and fertilizer (fol spray) contributed to increase the vegetative traits and leaf content of mineral elements as a result of containing appropriate proportions of the macro and microelements, Which reflected in improving these traits.

Table 4. Effect of foliar spraying with the nutritional solution and Fol spray fertilizer on the chemical traits of leaves for apple seedling (Anna cultivar)

Potassium %	Phosphorus %	Nitrogen %	Traits Treatments	
The nutritional solution (MICRO NATE) levels(g.L^{-1})				
1.30	0.14	1.11	0	
1.64	0.22	1.35	4	
1.93	0.27	1.53	8	
0.13	0.10	0.09	L.S.D 5%	
The nutritional solution (fol spray) levels(g.L^{-1})				
1.52	0.19	1.25	0	
1.63	0.21	1.33	3	
1.72	0.23	1.41	6	
0.13	0.10	0.09	L.S.D 5%	
The interaction levels between MICRO NATE and Fol spray (g.L^{-1})				
1.22	0.13	0.98	0	
1.30	0.14	1.14	3	0
1.39	0.16	1.21	6	
1.53	0.19	1.30	0	
1.66	0.22	1.36	3	4
1.74	0.25	1.40	6	
1.82	0.25	1.47	0	8

1.93	0.27	1.50	3
2.04	0.30	1.62	6
0.22	0.17	1.15	L.S.D 5%

References

- [1] Bramlage ,W.J 2001.Fruit Notes. Department of Plant and Soil Science University of Al-Qadisiyah.
- [2] AL-Nuaimi,S.A.N.A.2000.The Principles of Plant Nourishing (translated) . University of Mousel. Iraq, in Arabic. 772.
- [3] Juniper , B . E . , R . Watkins and S . A . Harris . 1998 . The Origin of the apple . Acta . Massachusetts **66**.
- [4] Al-Douri, Ali Hussein Abdullah and Adel Khudair Saeed Al-Rawi. FRUIT PRODUCTION. Ministry of Higher Education and Scientific Research. Dar Al Kutub For Printing & Publishing. University of Al Mosul. Iraq.
- [5] Ibrahim, Mohammed Atef. 1996. Deciduous fruit cultivated, nurtured and produced. Madbouly Press. Cairo . Egypt.
- [6] Denardi., F.Hough and A.P. Camilo.1988. Princessa Apple. *Hort. Science* .**23** (4):787.
- [7] Croker,T.F.,W. B. Sherman and J.G.Williaman.2004.The apple, Horticultural sciences depar ment ,florida extention service , institute of food and Agricultural Sciences, Universityof FloridaGainsville.FL32611
- [8] Al-Noaimi, Jabbar Hassan and Yousef Hana Yousef. 1980. Production of petroleum fruits. Ministry of Higher Education and Scientific Research. Albasrah university. Iraq.
- [9] Al-Jawari,A.K.S.2002.Effect of Spraying of Nutrients Different on Growth and Yield of Sweet Pepper (*Capsicum annum* L.).M.A.Thesis, College ofAgriculture. University of Baghdad. Iraq, in Arabic.
- [10] Hussein,M.M.,M.M Shaaban andA.K.M.EL-Saaly.2008 Response of cowpea plant grown under salinity stress to P , k- foliar application. *American J. of Plant Physiology*. **3** (2): 81-88.
- [11] Ramadan, M.A.E. and S.M. Adam.2007.The effect of chicken manure and mineral fertilizers on distribution of heavy metals in soil and tomato organs. *Australian J. of Basic and Applied Sci*. **1** (3): 226 -231 .
- [12] Al-Sahaf,F.H.1998.Nourishment of Practical Planting .University of Baghdad. Ministry of Higher Education and Scientific Research. Iraq, in Arabic. 256.
- [13] Alrawi, Khasha Mahmoud and Abdul Aziz Khalaf Allah. 1980. Design and analysis of agricultural experiments. The University of Al Mosul. Ministry of Higher Education and Scientific Research. Iraq.
- [14] John , M.K .1970. Colorimetric Determination of Posphoruse in soil and plant materials with ascorbic acid soil science , 109:214.
- [15] Jakson, M. L. 1958. Soil chemical analysis. Englewood cliffs prentic – Hall inc. Newjersey, U. S. A. pp. 498.
- [16] Taiz, L.and E.Zeiger.2006.Plant physiology.fourth Edition Sinauer Associates, Inc., publishers sunderland, Massachusetts.